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ABSTRACT

Rates of return to state investments for two of Maine's post-secondary vocational technical institutes are presented. Southern Maine Vocational Technical Institute showed a rate of return to the state economy of 12 percent; Northern Maine Vocational Technical Institute, 2 percent. The usefulness of rate of return analysis as a planning tool or as a method of accountability is discussed, since any school teaching occupational skills needs to be evaluated as to its effectiveness and efficiency in meeting that objective. A complete test must include (1) how well graduates fare in labor markets and (2) the cost of producing those graduates with those skills. In these respects rate of return compares very favorably with other instruments for planning or accountability. The technique does bring important information to a manager of educational resources. (Author/LBH)

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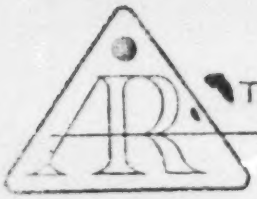

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Rate of Return to Southern Maine and Northern Maine Vocational Technical Institutes

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Abstract

This paper, first of all, presents rates of return for two of Maine's post-secondary vocational technical institutes. Southern Maine Vocational Technical Institute showed a rate of return to the State economy of 12%; Northern Maine Vocational Technical Institute, 2%. The second part considers the usefulness of rate of return analysis as a planning tool or as a method of accountability. Any school that is teaching occupational skills needs to be evaluated as to its effectiveness and efficiency in meeting that objective. A complete test must include (1) how well graduates fare in labor markets; and (2) the cost of producing those graduates with those skills. In these respects rate of return compares very favorably with other instruments for planning or accountability. The technique does have disadvantages of which any user must be aware, but the technique does bring important information to a manager of educational resources.

Rates of Return to Southern Maine and Northern Maine
Vocational Technical Institute

This paper presents rates of return to investments at Southern Maine and Northern Maine Vocational Technical Institutes (SMVTI and NMVTI). There is some literature on economic evaluations of post-secondary vocational and technical education but it is by no means exhaustive. (See Zymelman, 1976, for a recent survey). One purpose of this paper is to add to knowledge about the efficiency of this type of education. The second purpose is to comment on the usefulness of rate of return analysis as a management device.

The rate of return technique is a comparison of the incremental benefits for a particular level or type or amount of education with its incremental costs. The incremental benefits are the extra lifetime earnings associated the education in question (in this study, the two years of post-secondary education); the incremental costs are the sum of the direct education costs and the foregone earnings of students. Since the benefits occur in the future while costs take place now, a valid comparison of benefits and costs is only possible with discounting. The internal rate of return is that discount rate that equates the benefits to costs. If the rate of return is higher than is available with alternative uses of the funds, the education is a good investment; if the rate of return is lower than in other possible uses then the education is a poor investment. Rates of return can be calculated from the viewpoint of the national economy, the State economy, or the individual undertaking the education. The theoretical basis is that education enhances

productivity. The increase in productivity is measured by the change in earnings which represents the addition to total income arising out of investment in education. The technique is based on the work of Becker, 1964, Blaug, 1965, and many others. For a recent critique of the theory see Blaug, 1976. Rate of return analysis does not constitute a complete evaluation of a school since other objectives are not considered and other components of a complete evaluation are not covered; more on this topic below.

In the first part of this paper the rate of return study of the two Maine schools is presented. The last part considers the usefulness of such analysis for those who are managing schools.

Returns to Investment at SMVTI and NMVTI

SMVTI and NMVTI are two of Maine's six post-secondary vocational technical institutes. The schools are operated by the Maine State Board of Education under the direction of the State Department of Educational and Cultural Services. The largest part of the VTI program is two year occupational education for high school graduates. This study only considers graduates from these two year programs. School officials state that their schools are designed for the middle third of high school graduates, although in practice admissions are more open that this implies. SMVTI is located in South Portland and NMVTI is in Presque Isle. The schools have very different programs. They both attract students from all parts of the State but the largest number come from their local area; their graduates are found around the state (and outside) but the largest part are working in the local area.

Benefits. The benefits being considered are incremental earnings of SM and NM graduates, the extra earnings above and beyond what they would have earned had they not gone to school and gone to work instead. The average earnings of persons from each graduating class are shown in Table I. The figures were obtained in a telephone survey conducted by the Social Science Research Institute at the University of Maine at Orono during the spring of 1976. An attempt was made to reach one-half (randomly selected) SM graduates and all NM graduates from the previous five years. Only those who were still in the State and not in college were interviewed. About sixty-five percent of the graduates were found and successfully interviewed. Most of the others could not be located. The non-respondents were no different than respondents in either grade point average or in the program they had taken in the VTI. Persons who had graduated earliest were the most difficult to locate.

Estimates of what the VTI graduates would have earned had they not gone on to two years of post-secondary education are contained in column 3 of Table I. The data are based on a concurrent survey of Maine high school graduates. Principals and guidance counselors from seven high schools all over Maine were asked for lists of men who had graduated in the past seven years who had the ability to go to a VTI but had chosen to go to work instead. These men were also interviewed by telephone.

As is usual in a survey of this type there was a great deal of variation in earnings among individuals. This means that it is not difficult to find some high school graduates who are earning more than some VTI graduates. Indeed there were a few high school graduates who

were earning more than most VTI graduates. Nevertheless, on the average, SM graduates were earning substantially more and NM graduates a little more than high school graduates. The differences are shown in columns 4 and 5 of Table 1. The differences have been projected out to age 50 so as to be able to estimate incremental lifetime earnings. The projections are simply the average difference in earnings for ages 22-24, a device which presumably gives enough time for initial labor market problems to get settled.

Costs. The resources invested in a VTI education are the sum of recurrent costs, capital costs, and foregone earnings. Annual per student costs are contained in Table 2. The recurrent costs are based on actual expenditures of each VTI for the 1974-75 fiscal year, less the costs of room and board. (Room and board are living expenses that would have to be incurred anyway, whether the individuals were or were not in school, and should not be counted as an expense of the education.) Foregone earnings represent income lost because individuals are in school rather than working; they are taken directly from the data in Table 1 showing incomes of high school graduates during the first two years following high school. Capital costs are very difficult to estimate. There is a record of State expenditures for buildings, land and equipment but no one has tried to convert these expenditures into constant dollars or to estimate depreciation. (Repairs and maintenance as well as considerable equipment purchases and replacement are included in recurrent expenditures.) I have chosen to include as capital expenditures the annual cost of those funds which have

TABLE 1

Average Annual Earnings For Graduates of SMVTI, NMVTI and High School With No Further Education, Maine 1976

Age of Graduate, 1976	Average Annual Earnings			Incremental Earnings	
	SMVTI (1)	NMVTI (2)	HS (3)	SMVTI (4)	NMVTI (5)
18	$1000	$1000	$5304	$-4303	$-4304
19	1000	1000	6072	-5072	-5072
20	6684	6480	6708	- 24	- 228
21	7524	7044	7176	348	- 132
22	8904	8064	7092	1812	972
23	10,812	7560	5844	4968	1716
24	8988	8472	8748	240	- 276
25-50				2340	804

Sources: SMVTI and NMVTI, Columns (1) and (2)
Ages 18 and 19: Estimated earnings from part-time and summer employment.
Ages 20-24: 1976 survey of graduates from 1971-1975.
HS ages 18-24, column (3): 1976 survey of graduates from 1969-1975.

Incremental earnings, columns (4) and (5):
Ages 18-24: VTI earnings minus HS earnings
Ages 25-50: Mean difference for ages 22-24; see text for further explanation.

TABLE 2

Annual per student costs of a VTI education, 1974-75

SMVTI

	To National Economy	To State
Recurrent	$2111	$1396
Capital	251	218
Foregone Earnings	$4304-$5072	$4304-$5072
Total 1st year	$6666	$5918
2nd year	$7434	$6686

NMVTI

Recurrent	$3531	$7029
Capital	303	268
Foregone Earnings	$4303-$5072	$4303-$5072
Total 1st year	$8138	$7029
2nd year	$8906	$7797

Sources: Recurrent: total educational expenditures of each school for 1974-75 as provided by Bureau of Vocational Education, less expenses for room and board and adult education, divided by respective FTE. State costs excludes federal contribution; but includes tuition. Figures include an estimated $100 for books and other incidentals.

Capital: see text.

Foregone Earnings: Table 1, Columns 4 and 5.

been spent developing the VTI installation. For example, the State of Maine has spent about $4,900,000 at SMVTI for land, buildings and equipment (less the cost of dorms). Five percent (current costs of borrowing funds) of that figure is $246,000 and divided among the 1130 full-time equivalent students results in the $218 annual per student capital cost to Maine figure in Table 2. Similar reasoning was used to estimate the capital costs for NMVTI.

The total cost figure represents the average annual cost per student. The cost to the national economy is the total cost regardless of whether the costs are borne by the federal government, the state government, or the student. The cost to the State is the total cost less the federal contribution and includes costs incurred by the state government and the students.

Results. The internal rates of return, the discount rates that equate the average incremental income over a lifetime (from Table 1) with the incremental costs (from Table 2) are presented in Table 3. To judge whether a school is a good investment or not, the internal rate of return should be compared to the return available from alternative investments. For example, from the viewpoint of the State the rate of return to investments at SMVTI is 12%. This rate is substantially higher than the commonly accepted social discount rate (Stromsdorfer, 1972) and higher than recent estimates of the rate of return to a university education in the U.S. (Freeman, 1975). Similar results are obtained for the national economy. SMVTI is a good investment. (The reader should note that all

discount rates in this paper are in real terms, that is after the effects of inflation have been removed.)

The results for NMVTI are not good. From the viewpoint of the State the rate of return to investments at NMVTI is less than 2%; similar results are obtained from the viewpoint of the national economy. NMVTI graduates did show some incremental returns to their education but those returns were less than the costs of that education. NMVTI is a poor investment.

Is the rate of return useful?

There are two somewhat distinct uses for rate of return results such as those reported in the first part of this paper. First the figures can be used for planning, to aid in decisions about whether more or less resources should be devoted to a particular education as opposed to other competing uses. For example, since the 12% rate of return to SMVTI is probably better than the State can get on alternative uses of its resources then more should be devoted to that school. As for NMVTI, the rate of return is very low so spending should be shifted to higher yield investments (like SMVTI). The second use for rate of return results is for accountability: to find out if a school or set of schools are meeting particular objectives. The high rate to SMVTI is a signal that the school is doing a good job; the low rate to NMVTI is a signal that something is wrong and reasons for the low rate should be investigated and corrective action taken.

The technique is a form of evaluation but is far from a complete evaluation. The rate of return is measuring the effect and efficiency of

TABLE 3

Internal Rates of Return To The National Economy and State Economy, SMVTI and NMVTI, 1976

	Rate of Return	
	To National Economy	To State Economy
SMVTI	12%	12%
NMVTI	2%	2%

post-secondary education towards a particular objective. There are other objectives of education that are not considered and other components of an evaluation that are not covered (Suchman, 1967). However if a manager is interested in how well a school is preparing students for the labor market--and surely this is a primary objective for a post-secondary vocational technical institute--rate of return compares very well with alternative forms of measuring results or making plans.

The technique has two main advantages: (1) its outcomes measure, lifetime income, is unambiguous; and (2) the technique explicitly includes costs. Education is expensive and any good measure of educational effectiveness must include costs in its calculations. For an illustration of these advantages compare rate of return with an alternative methods of planning and accountability. Planning in Maine is greatly influenced by a modified form of the manpower requirements approach where future needs are based on projections made with an occupational-industrial matrix. (See Maine Department of Manpower Affairs, 1977.) This technique has a technical not an economic view of the demand for skilled people (Bowles, 1969), and completely ignores costs. As for accountability, consider a widely used measure of educational effectiveness, the number (or proportion) of graduates in education-related jobs. As usually presented this is strictly an outcomes measure and ignores costs. Ignoring costs tells only half the story since resources going into any educational program can be used in many different ways and, at the same time, there are alternative ways of reaching most occupational competencies. But even the outcomes measure, the work-relatedness test, is not as clear

cut as it first sounds and is subject to varying interpretations depending upon how the question is asked and who answers it. (Clark, 1977.)

Alongside its advantages, however, rate of return does have problems both conceptual and operational of which any user should be aware. On the conceptual side a basic premise is the validity of the marginal productivity theory, which implies that productivity differences among educational levels are reflected in observed differentials in earnings. Critics have argued that many wages are set by custom or administrative decisions, not by market forces and hence do not reflect factor scarcities. This may occur but if wage rates were administered prices, not market prices, then disequilibrium would occur and the market would not clear. For the two VTI's in this study all graduates were hired at measured wage rates (that is, the market cleared); therefore one can conclude that the wage rates were indeed market rates.

A second conceptual issue concerns the benefit measure, the lifetime earnings. One cannot wait a lifetime to make rate of return calculations. In this study we used cross sectional data to simulate earnings for the first five years after graduation and then projected outward from there. The validity of the projections has already been discussed. The issue raised here is that even in five years the quality of education and nature of labor markets may have changed; persons five years out of school may have had a different form of education and faced different labor markets as compared to individuals just now graduating. A redeeming feature is that with the high rates of return such as found at SMVTI it is the early years after graduation that have the largest impact on relative impact

and these data are the most accurate, easiest to get, and should bear the closest resemblance to current market conditions.

A third conceptual issue is that not all differences in earnings associated with education can be attributed to that education but are a result of differences in ability, family background, motivation, training, etc. We tried to account for some of these factors by choosing a control group that was close to the VTI graduates in age, sex, general ability, and high school attainment. Insofar as factors that contribute to the difference in earnings have been missed the measured rates of return are biased upward.

A fourth issue which is both conceptual and operational is that rate of return studies do not differente between internal and external efficiency. Internal efficiency refers to how well a school 'produces' persons with a particular form of training qualifications. External efficiency refers to whether those skills or qualifications are highly valued in relevant labor markets (Zymelman, 1976). The high rate of return to SMVTI probably means that the school is efficient both internally and externally. On the other hand, the low rate for NMVTI may mean that the school is a high cost producer, or it could mean that the school is teaching skills that are not valued very highly. The low rate is a trouble signal but does not necessarily indentify the source of the trouble.

A fifth issue is that rate of return results indicate the direction but not the amount of change. The results for SMVTI indicate that more resources should be devoted to the school but do not indicate how much more. Thus the results are less than 'complete', an operational problem which

in practice has caused planners to look elsewhere for data on which to base decisions. The fact that rate of return is incomplete does not necessarily imply that 'complete' information about the future is there for the asking. Planners who reject rate of return for this reason may be asking for more than anyone can deliver. This particular problem does not reduce the usefulness of rate of return for accountability purposes.

Some Conclusions

This paper has, first of all, presented rates of return for two post-secondary vocational technical institutes in Maine. The rate of return for Southern Maine Vocational Technical Institute was 12% and for Northern Maine Vocational Technical Institute, 2%. SMVTI is an excellent investment, NMVTI a poor one. As a planning tool, the rates of return indicate that resources should be increased to SMVTI, and reduced to NMVTI. As a measure of accountability, the rates show that SM is doing an excellent job, NM a poor job. These conclusions are predicated on the assumption that a primary objective of each school is to prepare individuals for the labor market.

The second part of the paper considers the usefulness of rate of return analysis. In other words, is the rate of return itself a good investment of a manager's resources? Any school that is teaching occupational skills needs to be evaluated as to its effectiveness and efficiency in meeting that objective. A complete test must include (1) how well graduates fare in labor markets; and (2) the cost of producing those graduates with those skills. The rate of return explictly does bring together costs as well as benefits. The technique has advantages

and disadvantages of which any user must be aware; many of these are spelled out in the paper. A rate of return is not a complete story, nor is it meant to be, but the technique does bring important information to a manager of educational resources.

One final comment of a practical nature. One-time studies without the understanding or involvement of school officials who are being evaluated is probably a waste of money. (See Fang, 1978). School officials responsible for occupational oriented education need to continually review the education/employment fit of their graduates. An ongoing program of rate of return studies should probably be one of the ways that they evaluate their own programs.

Footnotes

[1]The projections of incremental earnings for the years beyond the survey period probably understate the figures for SMVTI and may overstate them for NMVTI. A projection based on regression techniques for SMVTI show a slightly lower level of incremental earnings for age 25 but with that difference steadily widening in subsequent years. Projected earnings based on regression results yield even higher rates of return. National studies show a steadily increasing earnings differential up through at least age 50 betweem high school graduates and those with 1-3 years of post-secondary education. See U.S. Bureau of the Census, Current Population Reports. As for NMVTI, a regression results show even less of a difference for the future than is contained in Table I for ages 25-50. Indeed there was no discernible upward trend in earnings for NM graduates.

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